	L #	Hits	Search Text
1	L1	14140	((parallel concurrent$2 two) with (request input thread task) multitask$3 multithread multi) same cach$3 cach$3 same populat$3 and (bandwidth resource) and integer
2	L2	14037	((parallel concurrent$2 two) with (request input thread task) multitask$3 multithread multi) same cach$3 cach$3 same populat$3 and (bandwidth resource) same integer
3	L3	14006	((parallel concurrent$2 two) with (request input thread task) multitask$3 multithread multi) same cach$3 cach$3 same populat$3 same (bandwidth resource) same integer
4	L4	1	((parallel concurrent$2 two) with (request input thread task) multitask$3 multithread multi) same cach$3 and cach$3 same populat$3 same (bandwidth resource) same integer
5	L5	6	((parallel concurrent$2 two) with (request input thread task) multitask$3 multithread multi) same cach$3 and cach$3 same populat$3 and (bandwidth resource) same integer
6	L6	58	((parallel concurrent$2 two) with (request input thread task) multitask$3 multithread multi) same cach$3 and cach$3 same populat$3 and (bandwidth resource) and integer
7	L7	2	((parallel concurrent$2 two) near5 (request input thread task) multitask$3 multithread multi) same cach$3 and cach$3 same populat$3 and (bandwidth resource) and integer adj3 greater
8	L8	5	((parallel concurrent$2 two) near5 (request input thread task) multitask$3 multithread multi) and cach$3 same populat$3 and (bandwidth resource) and integer adj3 greater

US006434500B1

(12) **United States Patent**
Boehne et al.

(10) **Patent No.: US 6,434,500 B1**
(45) **Date of Patent: Aug. 13, 2002**

(54) **INTERFACE FOR MANAGING TEST DEFINITIONS**

(75) Inventors: **Scott D. Boehne**, Savage; **Todd A. Gates**, Lakeville; **Walt H. Sigtermans**, Apple Valley; **Patrick Dobrowski**, Burnsville, all of MN (US)

(73) Assignee: **Rosemount Inc.**, Eden Prairie, MN (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/419,958**

(22) Filed: **Oct. 18, 1999**

(51) **Int. Cl.**[7] **G01R 27/28**; G01R 31/00; G01R 31/14

(52) **U.S. Cl.** **702/120**; 345/967

(58) **Field of Search** 702/57–59, 67, 702/68, 108, 117, 118, 119, 120, 121, 122, 123, 182–185; 700/83, 86, 87; 345/769, 839, 846, 835, 771, 773, 967

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,576,946	A		11/1996	Bender et al.
5,598,521	A		1/1997	Kilgore et al.
5,617,120	A	*	4/1997	Kaneko 345/619
5,703,929	A	*	12/1997	Schillaci et al. 379/21
5,796,602	A		8/1998	Wellan et al.
5,828,851	A		10/1998	Nixon et al.
5,903,455	A		5/1999	Sharpe, Jr. et al.
5,933,353	A		8/1999	Abriam et al.
6,002,868	A	*	12/1999	Jenkins et al. 717/1
6,006,171	A	*	12/1999	Vines et al. 702/184
6,128,016	A	*	10/2000	Coelho et al. 345/808
6,141,608	A	*	10/2000	Rother 701/33
6,095,674	A1	*	8/2001	Verissimo et al. 700/83
6,330,517	B1	*	12/2001	Dobrowski et al. 702/104

FOREIGN PATENT DOCUMENTS

WO	WO 98 14855	4/1998
WO	WO 98/36335	8/1998
WO	WO 98 36353	8/1998

OTHER PUBLICATIONS

Holladay et al., "Specification for Field Calibrator Interface", Southwest Research Institute, Mar. 25, 1999.

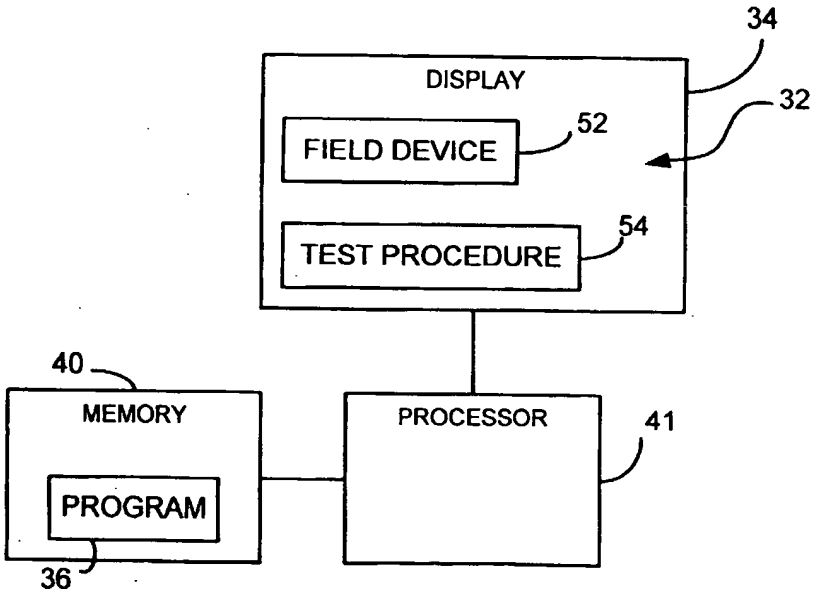
* cited by examiner

Primary Examiner—John S. Hilten
Assistant Examiner—Demetrius Pretlow
(74) *Attorney, Agent, or Firm*—Westman, Champlin & Kelly

(57) **ABSTRACT**

A method and apparatus for graphically managing test definitions of a field management system is disclosed. The method and apparatus establish a graphical user interface that is simple to use, efficient, user friendly, and displays test definition related information in an organized manner that can be easily understood by a user. The interface includes a device icon and a test procedure icon presented on a display. The device icon identifies testing data of a field device and the test procedure icon identifies a test procedure that has device testing parameters corresponding to the testing data. A test definition for the field device is created when the device icon and the test procedure icon are associated with each other.

29 Claims, 8 Drawing Sheets



US006219829B1

(12) **United States Patent**
Sivakumar et al.

(10) **Patent No.: US 6,219,829 B1**
(45) **Date of Patent: Apr. 17, 2001**

(54) **COMPUTER SOFTWARE TESTING MANAGEMENT**

(75) Inventors: **Arunachallam Sivakumar**, Woburn; **Stephen L. Kaufer**, Newton, both of MA (US)

(73) Assignee: **Compuware Corporation**, Farmington Hills, MI (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/500,047**

(22) Filed: **Feb. 8, 2000**

Related U.S. Application Data

(63) Continuation of application No. 08/838,090, filed on Apr. 15, 1997, now Pat. No. 6,031,990.

(51) **Int. Cl.**[7] **G06F 11/00**
(52) **U.S. Cl.** **717/4**; 717/8
(58) **Field of Search** 717/8, 4

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,313,616	5/1994	Cline et al.	717/4
5,357,452	10/1994	PioDiSavoia et al.	702/108
5,390,325	2/1995	Miller	714/38
5,490,249	2/1996	Miller	714/38
5,500,941	3/1996	Gil	714/38
5,715,461	2/1998	Yoshitomi	717/10
5,784,553 *	7/1998	Kolawa et al.	714/38
5,794,043 *	8/1998	Kolb	717/4
5,974,255 *	10/1999	Gossain et al.	717/4
6,023,580 *	2/2000	Sifter	717/4
6,031,990	2/2000	Sivakumar et al.	717/4

OTHER PUBLICATIONS

Doong et al., Case studies on Testing Object–Oriented Programs, ACM pp. 165–177, 1991.*
Harrold et al., Incremental Testing of Object–Oriental Structures, ACM, pp. 68–80, 1992.*
"Buster" Test Management System User's Guide, AT&T, Issue 5, 09/94, Chapters 3, 4 and 9.
Bellcore, MYNAH™ System User Guide, Executive, Analyst, Feather Domain Driver, May 1993; Chapters 4, 5, 8 and 9.
TestExpert Automated Test Management System, User and Administrator Guide, Col. 1, Qualtrak, Release 2.1, vol. 1, Chapters 4, 6, 7 and 9; 1993.
Compuware QADirector User's Guide, A QACenter Application Testing Product, Release 2.3, 1997; entire document.
SQA Robot™ User's Guide, Developing and Executing Automated Tests for Cross–Windows™ Client/Server, 1996 Applications, Chapters 2, 5 and 8.
Mercury Interactive, WinRubber, User's Guide, Version 4.0, Part VIII, pp. 291–312, 1996.
The GNU Testing Framework, DejaGnu, http://www.gnu.org/manual/dejagnu/text/dejagnu.txt., 1996, pp. 1–48.
Mercury Interactive, TestDirector User's Guide, Chapters 9 and 11.

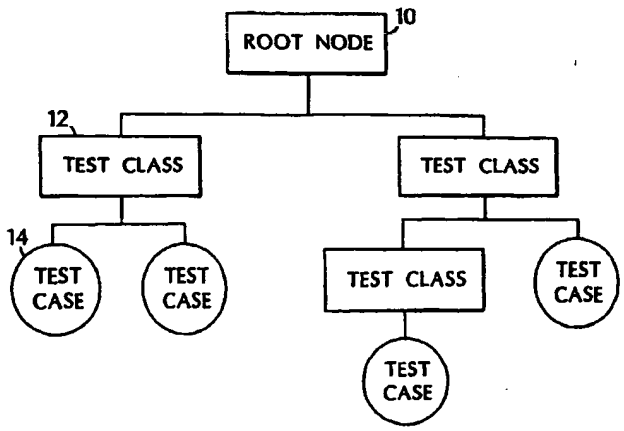
* cited by examiner

Primary Examiner—Mark R. Powell
Assistant Examiner—John Q. Chavis
(74) *Attorney, Agent, or Firm*—Fish & Richardson P.C.

(57) **ABSTRACT**

A test management system is provided having high flexibility of test structuring capabilities, and fine-grained control over how tests are executed. The test management system is extensible; i.e., it can integrate with modern testing tools without requiring a modification of the system itself. More specifically, the test management system uses concepts such as encapsulation and inheritance in order to provide powerful test structuring and test execution capabilities and a framework for integrating with multiple "point tools" that create test cases or help analyze the state of a software program. As is the case with object-oriented software, the test management system is very extensible and new point tools can easily be integrated with the system. The test management system also allows reuse of "rules" specified at different levels in the test structure.

17 Claims, 8 Drawing Sheets



US006031990A

United States Patent [19]

Sivakumar et al.

[11] Patent Number: 6,031,990

[45] Date of Patent: Feb. 29, 2000

[54] **COMPUTER SOFTWARE TESTING MANAGEMENT**

[75] Inventors: **Arunachallam Sivakumar**, Woburn; **Stephen L. Kaufer**, Newton, both of Mass.

[73] Assignee: **Compuware Corporation**, Farmington Hills, Mich.

[21] Appl. No.: **08/838,090**

[22] Filed: **Apr. 15, 1997**

[51] **Int. Cl.**[7] **G06F 11/00**

[52] **U.S. Cl.** **395/704**

[58] **Field of Search** 395/704

[56] **References Cited**

U.S. PATENT DOCUMENTS

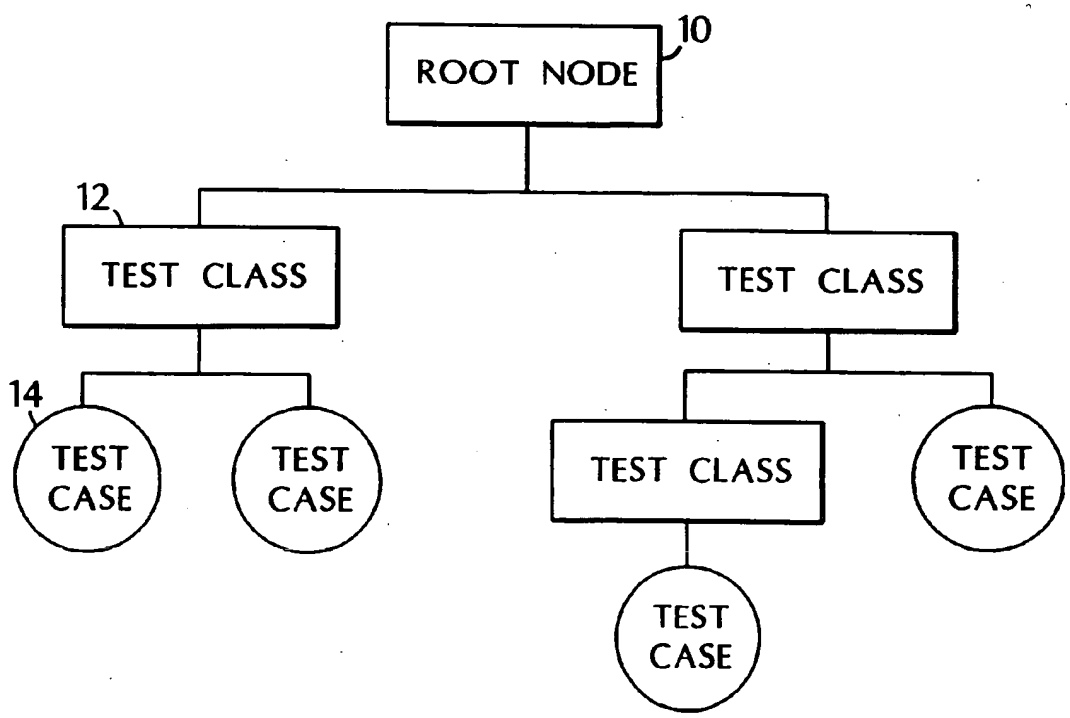
5,313,616	5/1994	Cline et al.	395/704
5,357,452	10/1994	Pio-di-Savoia et al.	702/108
5,390,325	2/1995	Miller	395/704
5,490,249	2/1996	Miller	395/183.14
5,500,941	3/1996	Gil	714/38
5,715,461	2/1998	Yoshitomi	395/710
5,794,043	8/1998	Kolb	395/704

Primary Examiner—Tariq R. Hafiz
Assistant Examiner—John Q. Chavis
Attorney, Agent, or Firm—Fish & Richardson PC

[57] **ABSTRACT**

A test management system is provided having high flexibility of test structuring capabilities, and fine-grained control over how tests are executed. The test management system is extensible; i.e., it can integrate with modern testing tools without requiring a modification of the system itself. More specifically, the test management system uses concepts such as encapsulation and inheritance in order to provide powerful test structuring and test execution capabilities and a framework for integrating with multiple "point tools" that create test cases or help analyze the state of a software program. As is the case with object-oriented software, the test management system is very extensible and new point tools can easily be integrated with the system. The test management system also allows reuse of "rules" specified at different levels in the test structure.

16 Claims, 8 Drawing Sheets



US005991537A

United States Patent [19]

McKeon et al.

[11] Patent Number: 5,991,537

[45] Date of Patent: Nov. 23, 1999

[54] **VXI TEST EXECUTIVE**

[75] Inventors: **Brian T. McKeon**; **Mark C. Larson**, both of Newport; **Douglas H. Sherman**, Cranston, all of R.I.

[73] Assignee: **The United States of America as represented by the Secretary of the Navy**, Washington, D.C.

[21] Appl. No.: **08/969,530**

[22] Filed: **Sep. 16, 1997**

[51] **Int. Cl.**[6] **G06F 9/45**

[52] **U.S. Cl.** **395/704**; 395/704; 395/705

[58] **Field of Search** 395/701, 703, 395/704, 700, 705; 702/120; 345/349, 333; 706/47; 714/28

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,901,221	2/1990	Kodosky et al.	345/348
4,914,568	4/1990	Kodosky et al.	345/349
5,319,645	6/1994	Bassi et al.	714/38
5,539,907	7/1996	Srvastave et al.	395/705
5,600,789	2/1997	Parker et al.	714/38
5,680,542	10/1997	Mulchandani et al.	714/28
5,689,684	11/1997	Mulchandani et al.	395/500.44
5,715,373	2/1998	Desgrousilliers et al.	706/47
5,724,273	3/1998	Desgrousilliers et al.	702/120
5,754,755	5/1998	Smith	395/183.14
5,790,117	8/1998	Halviatti et al.	345/333

OTHER PUBLICATIONS

Sefika et al, "Monitoring compliance of a software system with its high level designe models", Proc of ICSE, IEEE, pp. 387–396, 1996.

Ostrand et al, "A visual test devlopment environment for GUI systems", ISSTA ACM pp. 82–92, Aug. 1998.

Goforth et al, Implemenation of an automated EMS optimization program using as embeded expert system, ACM pp. 349–352, 1992.

Stocks et al, Test templets a specification based testing framework:, IEEE pp. 405–414, 1993.

Kasik et al, "Toward automatic generation of novice user test scripts", CHI Conf. proc. in human factor in computing sys, pp. 244–251, 1996.

Primary Examiner—Tariq R. Hafiz
Assistant Examiner—Anil Khatri
Attorney, Agent, or Firm—Michael J. McGowan; Robert W. Gauthier; Prithvi C. Lall

[57] **ABSTRACT**

A system is provided for developing program test sets with test hardware conforming to well known test industry standards, such as VXI, VME and GPIB standards. The system has a computer with a display console. After initialization and password checks, the console displays a front panel from which a user chooses the instruments, switches, connections, inputs, outputs, etc. which make up the program test set. As each choice is made, the system generates test script corresponding to the choice. The system then uses the test script, or macro, to generate the graphical representation of the component and its connections on the display. The graphical displays are standardized for each functional component or operation of a program test set, as well as being standardized between program test sets. The macros further allow a program test set to be more efficiently developed by coding macros rather than by developing graphical displays. The combined macros for the entire test set provide written documentation for the program test set, allowing for easy configuration management of the program test set.

19 Claims, 2 Drawing Sheets